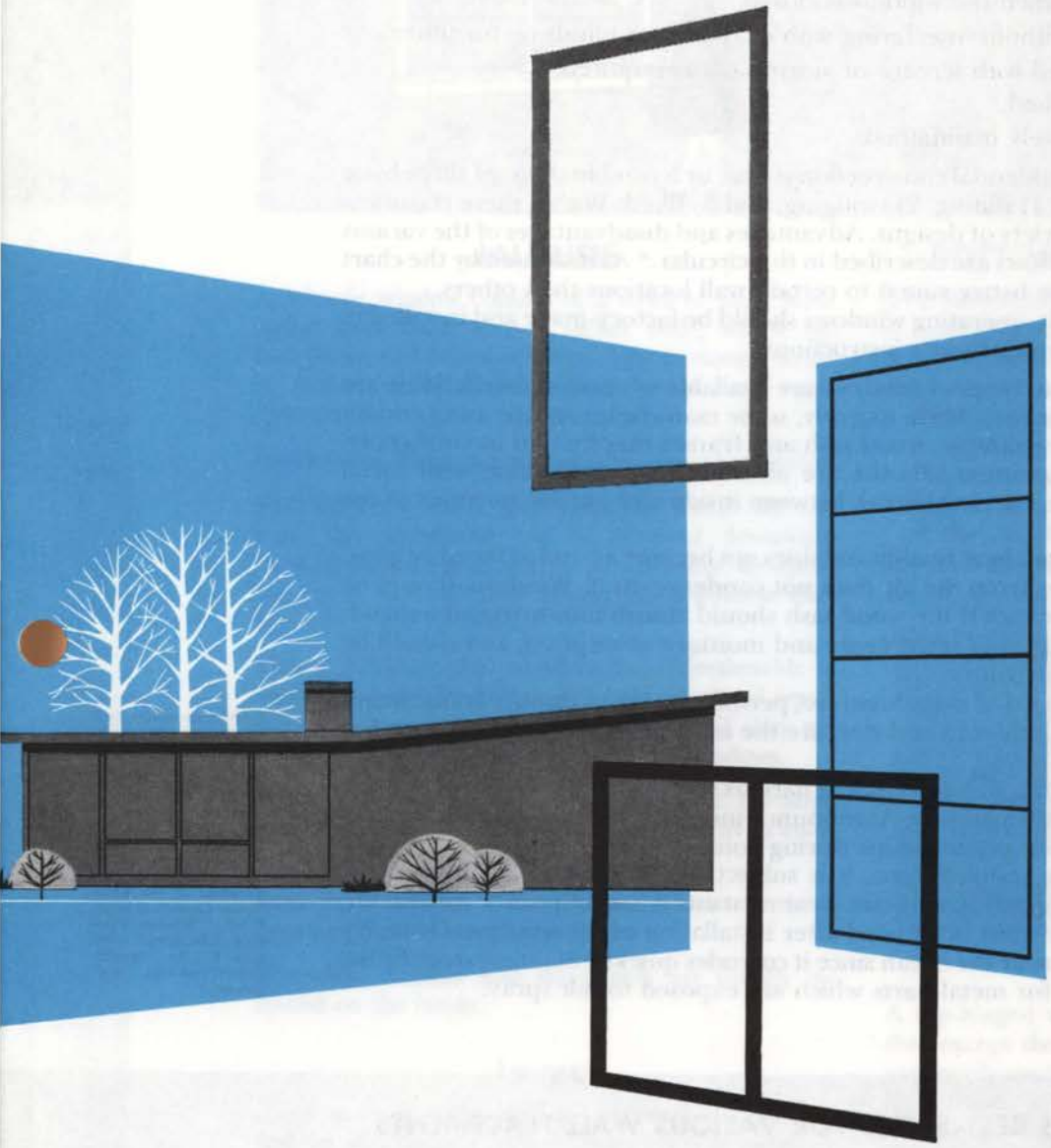
CIRCULAR SERIES

INDEX NUMBER F11.1

# SELECTING WINDOWS



ISSUED BY THE

SMALL HOMES COUNCIL – BUILDING RESEARCH COUNCIL



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SELECTING WINDOWS
SMALL HOMES COUNCIL F11.1

# SELECTING WINDOWS

Several factors, including initial cost, influence the choice of windows for a house. In making your selection, consider whether the window:

- Can be used to provide daylight in adequate amounts.
- Can provide desired ventilation.
- Is free from objectionable obstructions to view.
- Can be economically adapted to construction techniques to be used.
- Is fitted with hardware which makes operation of the window easy.
- Is weather-tight when the window is closed.
- Can be opened without interfering with draperies or blinds or furniture.
- Can be easily fitted with screens or storm sash as required.
- Can be easily washed.
- Can be inexpensively maintained.

Every window used in residential construction is one, or a combination, of three basic window types, namely: 1) sliding, 2) swinging, and 3) fixed. Within these classifications are windows of a variety of designs. Advantages and disadvantages of the various types and designs of windows are described in this circular.* As indicated by the chart below, some windows are better suited to certain wall locations than others.

To assure precision fit, operating windows should be factory-made and installed in accordance with the manufacturer's instructions.

**Materials:** All the various types of windows are available in wood or metal. Some are also made with plastics frames. More recently, some manufacturers are using combinations of materials. For example, wood sash and frames may be clad in vinyl (polyvinyl chloride) or in aluminum. Plastics are also used in combination with metal windows so as to achieve a thermal break between inside and outside portions of the window.

Wood does not transmit heat readily and does not become as cold as metal or glass; therefore moisture vapor from the air does not condense on it. Windows should be made so that they do not stick if the wood sash should absorb moisture and expand. The wood should be treated to resist decay and moisture absorption, and should be covered with two coats of paint.

Metal is stronger than wood and, therefore, permits the use of thinner frame members around windows. Aluminum and steel are the most common metal windows for homes.

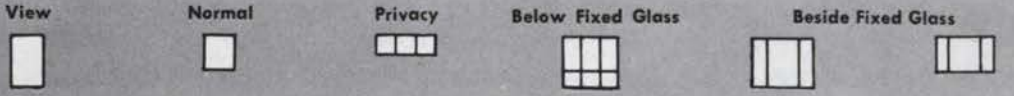
Aluminum forms a thin, adherent film of hard oxide which is extremely protective and eliminates the need for painting. Aluminum windows are protected with factory-applied lacquer to prevent plaster stains during construction.

Unless steel is of the stainless type, it is subject to corrosion if left unpainted. Ordinary steel is usually given an anti-rust treatment and a coat of primer paint at the factory. Additional paint must be applied after installation of the window. Ordinary steel should not be used near the ocean since it corrodes quickly. Stainless steel, brass, and aluminum are best for metal parts which are exposed to salt spray.

* Publication results from a research investigation on windows made by the Small Homes Council under a grant given to the University of Illinois by the Lumber Dealers Research Council. Principles for the design and placement of windows are discussed in the Small Homes Council circular, F11.0, "Window Planning Principles." See also F11.2, "Insulating-Windows and Screens."

## WINDOWS BEST-SUITED FOR VARIOUS WALL PLACEMENTS

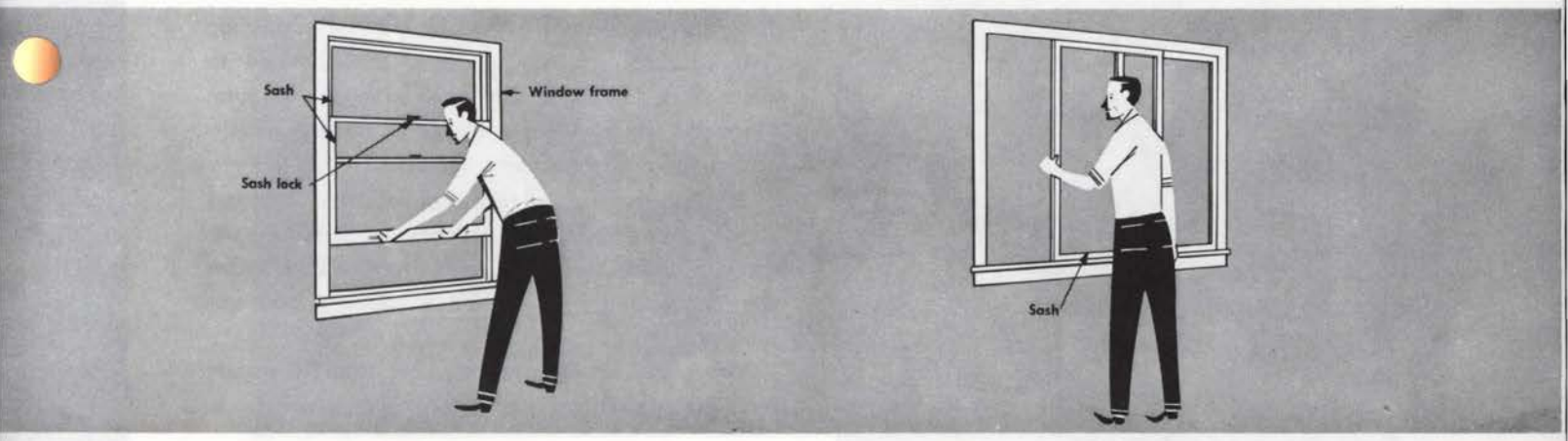
Operating windows preferred for various placements in the wall are indicated by "X"; windows which can be satisfactorily used in those positions, by "x." Window sill heights are given below illustrations.




| | 0′ to 1′ | 2′ to 3′-6″ | 4′-6″ to 5′-6″ | 0′ to 1′ | 0′ to 1′ | 2′ to 3′-6″ |
|---|---|---|---|---|---|---|
| Double-Hung | | x | | | | x |
| Horizontal-Sliding | X | X | X | x | x | x |
| Casement | | X | x | x | | X |
| Awning | x* | x* | X | X | X | X |
| Jalousie | | | x | x | x | x |
| Louver | | | | X | x | x |
| Top-Hinged, Inswinging | | | x | | | |
| Bottom-Hinged, Inswinging | | | | X | | |

* If horizontal bars are narrow (less than 2 inches), they do not seriously interfere with view.

# SLIDING WINDOWS




## DOUBLE-HUNG

A double-hung window consists of two sash* which slide up and down in grooves of a window frame. The sash can be opened from top or bottom. In some windows, the sash are removable.

**Hardware:** Some sash are supported at the sides by springs or weights which minimize the effort required to raise the sash. Other windows have friction devices to hold sash in open position.

**Ventilation:** Sliding windows are not as suitable as swinging windows for obtaining maximum benefit from natural air movement since 1) only half of the window can be opened at one time, and 2) summer breezes cannot be scooped in or directed to rear of room. Latter disadvantage can be overcome somewhat by the use of venetian blinds or similar auxiliary controls.

**View:** The horizontal divisions between top and bottom sash interfere with vision. When windows are opened, interference is greater.

**Weathertightness:** All sliding windows must be weatherstripped, preferably at the factory.

**Maintenance:** Do not paint track in which sash slides. Apply a penetrating wax finish to wood track.

**Ease-in-Washing:** Glass is troublesome to wash unless sash are removable.

**Remarks:** Wood double-hung windows have been used extensively because of their availability, simplicity and economy. They are manufactured in a wide range of sizes.

Window is awkward to open and close when located above kitchen sink or large pieces of furniture.

Sash are not apt to warp or sag since they slide within frame and are supported on both sides.

Screen is installed on outside of window opening to permit easy opening and closing of sash.

## HORIZONTAL-SLIDING

The sash in this window slide horizontally. Usually there are two movable sash; sometimes one is fixed.

**Hardware:** Most sash are light enough to slide in sill tracks (metal or plastic recommended). Door-height sash require rollers; overhead tracks are preferred.

**View:** Vertical divisions, where sash meet, do not interfere with vision as much as the horizontal rails in double-hung windows since a person can look around a vertical obstruction easier than a horizontal one.

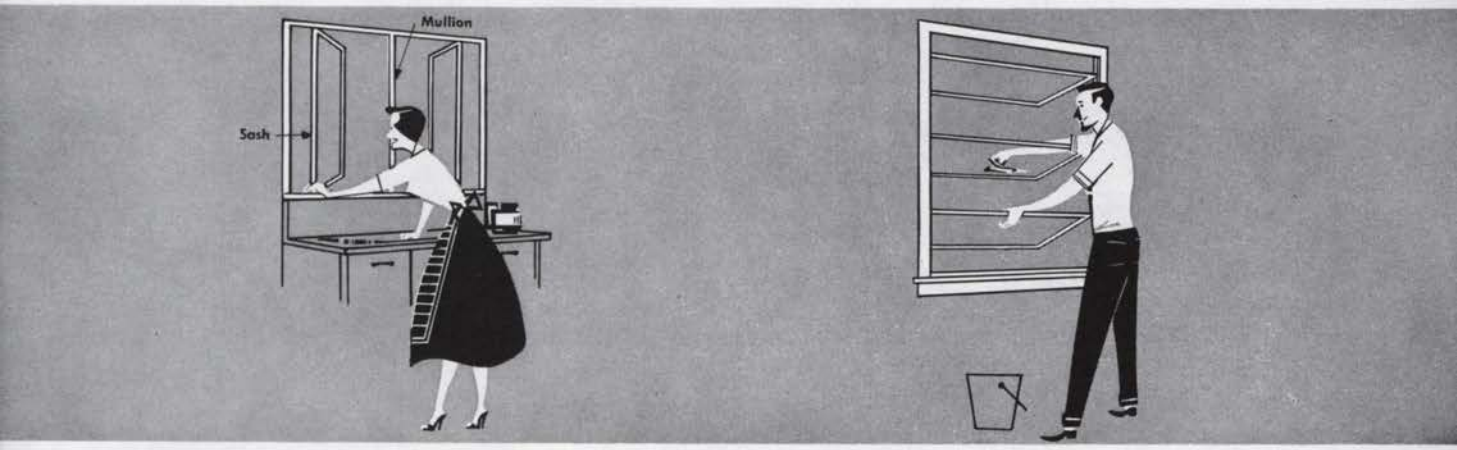
**Maintenance:** Metal or plastic tracks do not require special maintenance.

**Ease-in-Washing:** Some units are designed so sash can be removed for washing. This is important where sash are easily handled but difficult to reach from outside. The advantage is lost if sash are too large.

**Remarks:** Sizes range from small sash, such as are used in ribbon windows, to ceiling-height sliding doors.

* When only one sash is used, window is referred to as vertical sliding (see illustration, page 6).

# OUTSWINGING WINDOWS




## CASEMENT

A casement window consists of sash hinged at the side to swing outward.* Usually two or more sash, separated by a mullion, are used in a frame.

**Hardware:** Window can be opened or closed by either a crank or push-bar on the frame, or a handle on the sash. If the push-bar or crank pushes only the bottom part of the sash, the operation will strain tight-fitting sash. Use latches on frame to hold sash tightly when closed; two are recommended for tall sash.

Hinges should allow arm space between sash and window frame for easy washing of windows. Sliding-arm, extension-arm or maintenance hinges are recommended. The first two are available as friction hinges for use with handle operator.

**Ventilation:** Outswinging window can scoop in air which would otherwise pass the opening — *i.e.*, air moving parallel to wall surface. If wind direction is changeable, open only those sash which catch breeze from the right or left, depending on wind direction.

**View:** Vertical window divisions (1½ to 2½ feet apart) interfere with view, but are not as objectionable as horizontal divisions at eye level sometimes found in other types of windows.

**Weathertightness:** Weatherstripping is required, factory application being preferred.

**Remarks:** Use of crank operator makes window easy to open and close even when located above kitchen sink or furniture or when placed high in wall.

Inside screens and storm sash used with these windows are easy to change. To facilitate opening or closing of outswinging window having no crank or push-bar, inside screen or storm sash must be hinged or must have sliding access panels.

Since the sash project outward, people are apt to bump into them. Avoid placing walks, play areas within arc of outswinging windows.

Width of each sash is limited to about 2½ feet because the weight of an opened sash strains hinges. Because of this strain, the frame of the sash and the hardware must be sturdy.

* Casement windows can be hinged to swing inward, but these are seldom used since they do not offer an effective means of ventilation; they interfere with draperies and window blinds; they limit use of space next to window; and they are hard to keep watertight.

## AWNING

An awning window is hinged at the top. It is manufactured as a single unit or as several sash stacked all in one frame. When opened, the sash project out at an angle like "awnings."

**Hardware:** Hardware must hold both sides of the sash equally so the sash does not twist; a dual-arm control is recommended. A push-bar or crank operator permits window to be opened or closed without removing screen or storm sash.

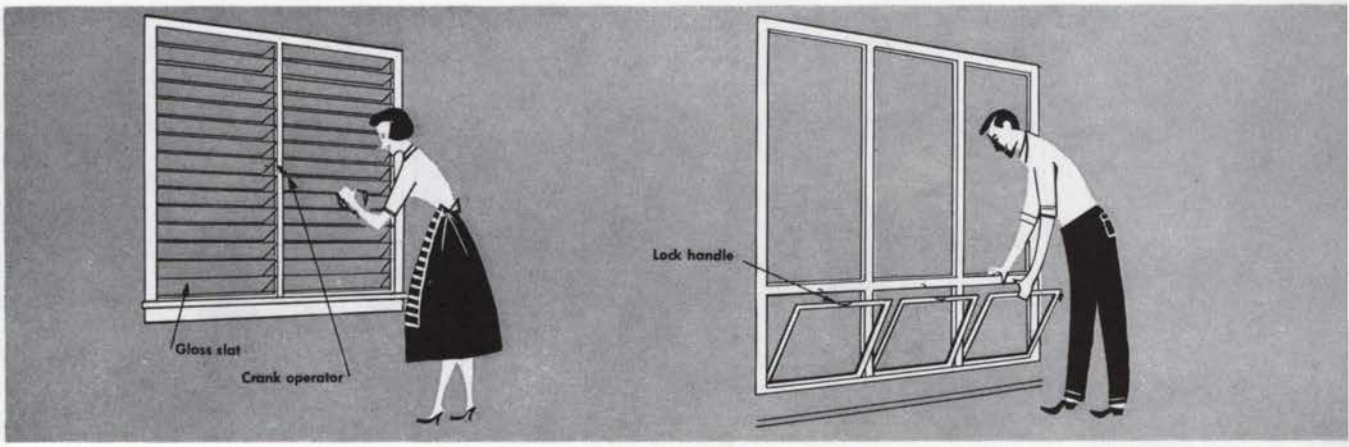
Multiple sash can be operated in unison by means of a crank connected to a series of arms.

**Ventilation:** Unless sash is opened to a full horizontal position (90°) or is placed low in the wall, summer breezes are diverted so they flow above the occupied portion of room. Inside controls, such as a venetian blind, can be used to direct the breeze downward if the sash is not fully opened.

**View:** Horizontal bars of stacked units may block view as bars are apt to be at eye level. Narrow-framed sash block view less than heavy-framed sash.

When opened, this window collects dirt easily because of its horizontal surface.

Ability of awning windows to keep out rain when opened has been overrated although this window is better than others.




## JALOUSIE

A jalousie window consists of a series of small horizontal glass slats, 3 to 8 inches wide, which are held by an end frame of metal. The sections operate in unison, similar to venetian blinds, and open outward.

**Hardware:** Panes are adjusted by a crank operator.

**Ventilation:** When glass sections rotate 90° or more, air movement can be directed downward through the occupied portion of the room. By opening the window slightly, ventilation is possible during rain if wind is mild.

**View:** Multiple-glass divisions are objectionable to view. Jalousies should be used only if natural ventilation is more important than view, or if they are installed below or at the sides of view windows.

**Weathertightness:** Even with storm sash, the large number of openings (between slats) results in cold-air leakage in winter.

**Ease-in-Washing:** Glass is troublesome to wash because of many small glass sections.

**Remarks:** Screens and storm sash are usually installed on the inside.

## Louver

A louver is a ventilating wall opening with characteristics similar to a jalousie except it is of wood or metal instead of glass; hence, it is not strictly a window.

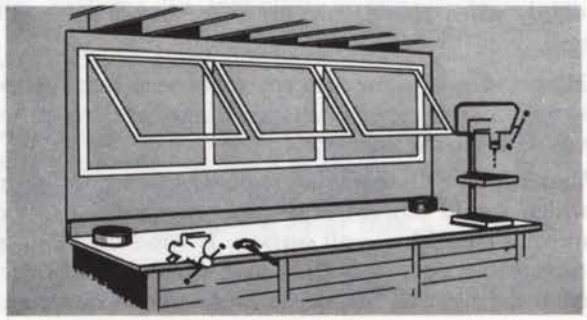
Its advantages over a jalousie include 1) ventilation with privacy since it is not of glass, and 2) ventilation without the interference of draperies since they are not needed.

## BOTTOM-HINGED (OR HOPPER)

This inswinging window is hinged at the bottom. It is opened by lock-handle at top of the sash. Usually it is manufactured as a single unit. A bottom-hinged window should be placed low in the wall for:

- Effective air movement since window can direct breeze upward only.
- Ease in washing from inside.
- Ease in opening.
- Non-interference with draperies.

Because the sash swings inward, it interferes with use of space near window.



## TOP-HINGED

A top-hinged window is similar to an awning window except the sash swings inward. The window is commonly used for basements. It is also suitable for high ribbon-windows, in which case, a wide overhang is desirable. Place window high in wall for:

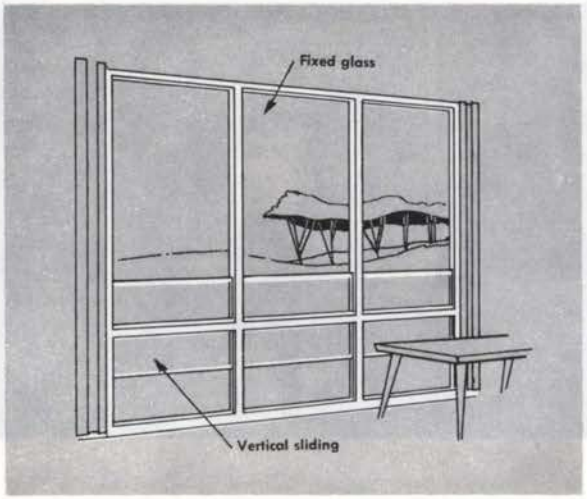
- Effective ventilation. These windows deflect air downward so that air flows through the occupied level of room.
- Ease in washing from inside.
- Privacy without use of draperies.

Since the sash swings inward, it interferes with use of space near window.

## Multiple-Use Windows

The multiple-use window is a single sash, which is designed so that it can be installed as any type of 1) outswinging window, or 2) inswinging window if it is furnished with interchangeable hardware and is correctly weatherstripped. This window is usually used in groups. Notes on pages 4 and 5 for the various types of windows apply. Window is relatively low in cost due to larger production, fewer sizes, improved production techniques, and simpler hardware.

# FIXED AND COMBINED WINDOWS




The function of the fixed window is not to provide ventilation, but rather to admit daylight and to allow the extension of one's vision beyond a room. Since this window does not open, hardware, weatherstripping and screen are unnecessary.

Because the sizes of factory-made fixed sash and frames are limited, many builders and architects use specially made frames to receive glass. This makes the variety and size of fixed windows almost unlimited.

Large-size window panes (more than 12 square feet) are economical only in fixed glass installations.

## COMBINED WINDOWS

The fixed window can be used in combination with sliding and swinging windows, thus achieving a window which can best serve its several purposes. While the sliding and swinging windows must provide daylight, ventilation and view all in one opening, the combined window separates these functions — that is, the fixed window provides daylight and view, and the sliding or swinging window (or louver) with which it is combined provides ventilation. As a result, conflict as regards type, size and placement of windows in fulfilling the various functions is lessened.

The fixed glass can be combined with operating sash placed on one or both sides, above it, or below it. Such windows can be of any height, including floor-to-ceiling.

Each of the combined windows shown here fulfills the requirements of a well-designed window. Two of the windows have ventilation openings below the fixed glass, and two at the side.